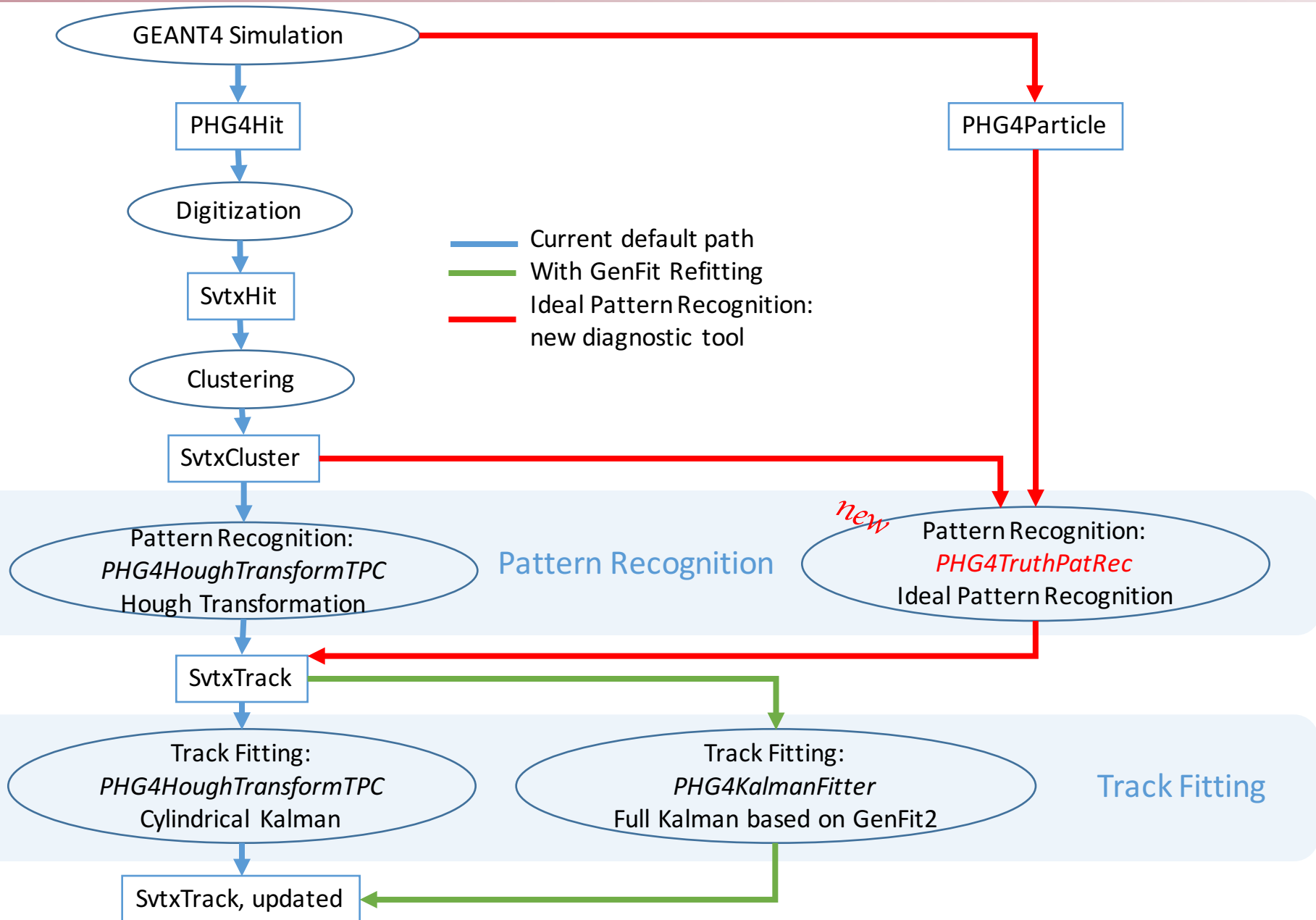


Debugging momentum reconstruction using Truth Pattern Recognition + GenFit2 Kalman

Jin Huang(BNL), Haiwang Yu (NMSU)

Overview of sPHENIX tracking and new module introduced

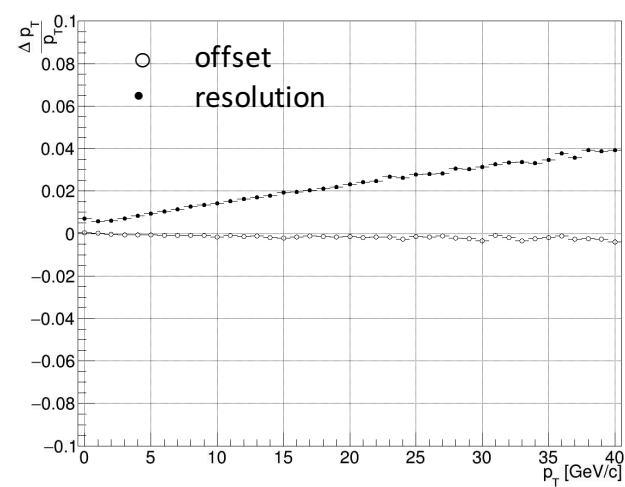


Momentum reco. with Truth Pattern Recognition + GenFit2 Kalman

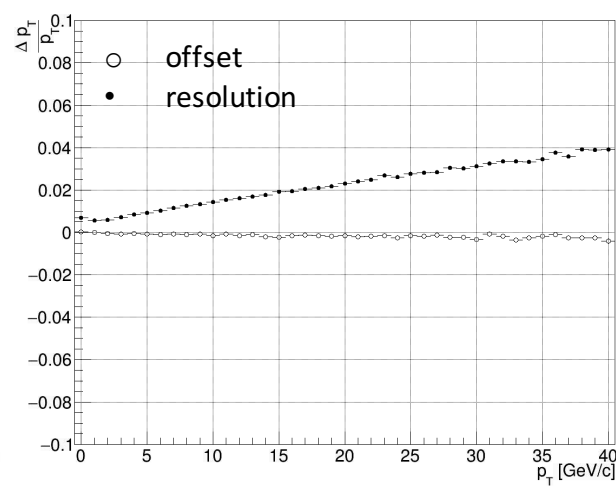
- Full GEANT Simulation
 - Digitization
 - Clustering
- Truth Pattern Recognition
 - Cluster grouping
- GenFit2 Kalman Track Fitting
 - Momentum
 - DCA.

- Cylinder Tracker:
Cylindrical MAPT+INTT (0.87 X_0 support) +TPC, sPHENIX repository
 - Cylinder Tracker with ladder INTT material budget:
Cylindrical MAPT+INTT (1.79 X_0 support) +TPC
 - Ladder tracker:
Ladder MAPS + Ladder INTT + Cylindrical TPC
Modified from Tony's macro:
/sphenix/user/frawley/QTG_simulations/macros/macros/g4simulations/G4_Svtx_maps_ladders+intt_ladders+tpc.C
- All the macros could be found:
<https://github.com/HaiwangYu/macros/tree/TruthPatRec/macros/g4simulations>

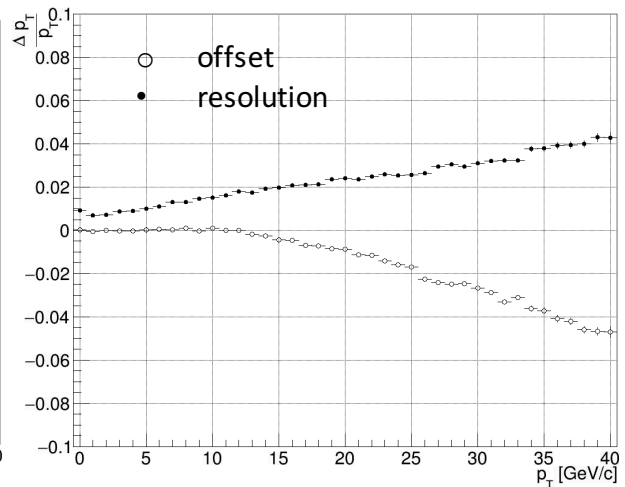
Cylinder Tracker



Cylinder Tracker with ladder INTT material budget

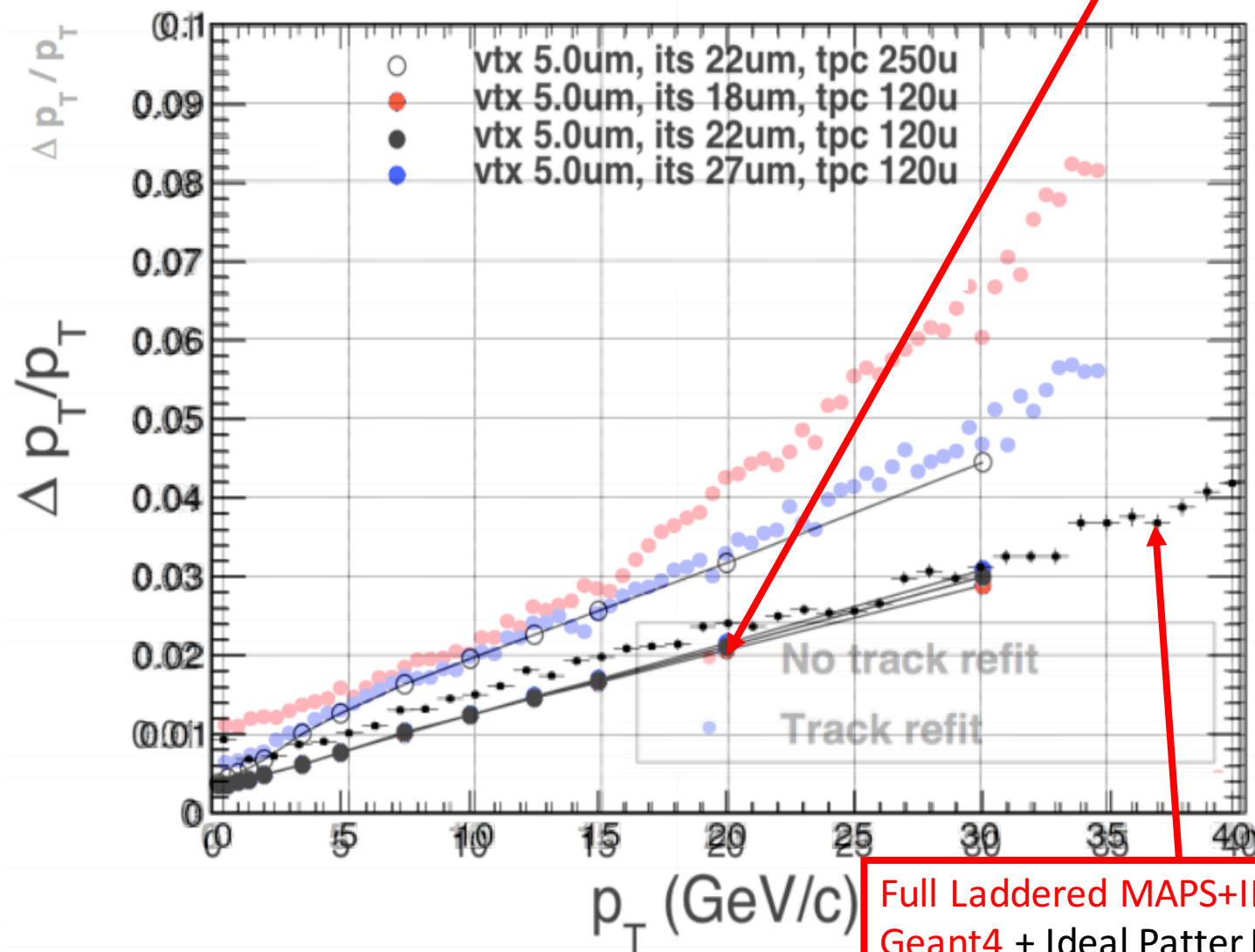


Ladder tracker



Compare with LiC fast simulation

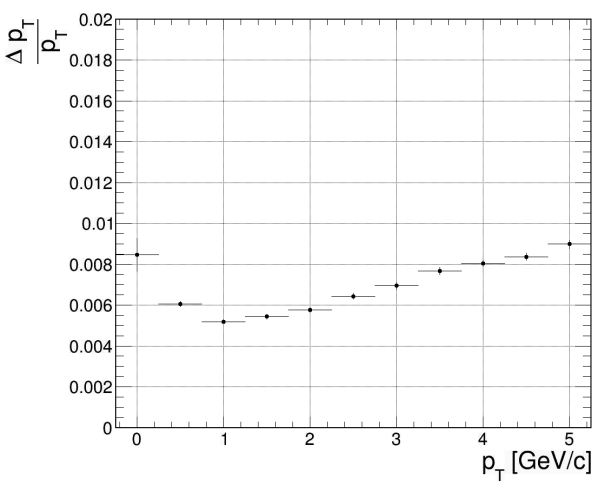
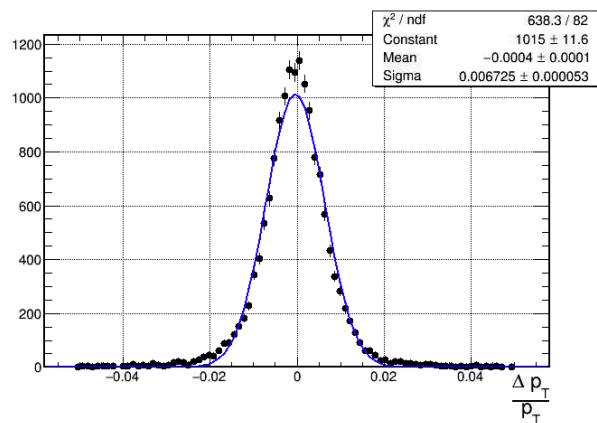
Bench mark: LiC toy simulation
by Christof Roland



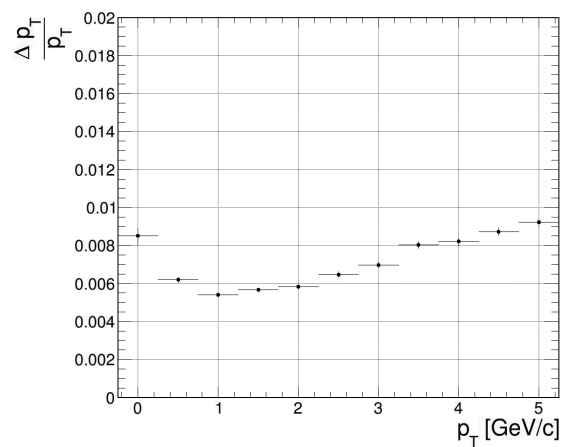
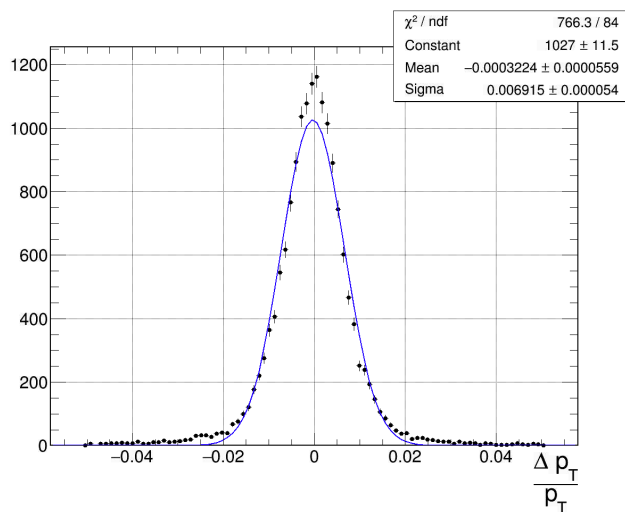
Full Laddered MAPS+INTT+TPC
Geant4 + Ideal Pattern Recognition
+ Full Kalman fit (GenFit2)

Zoom in to pT 0 - 5 GeV/c

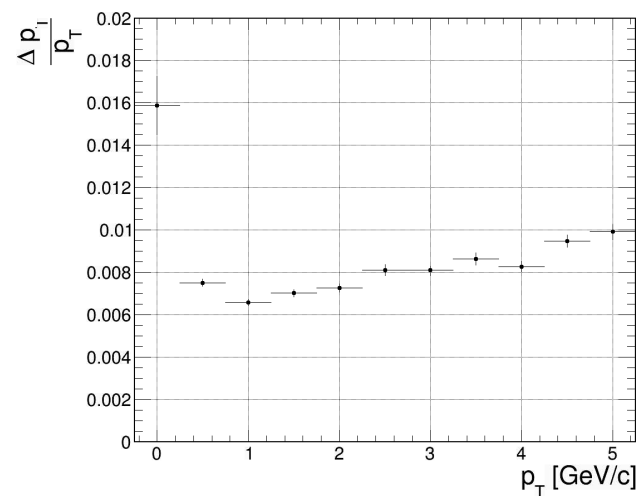
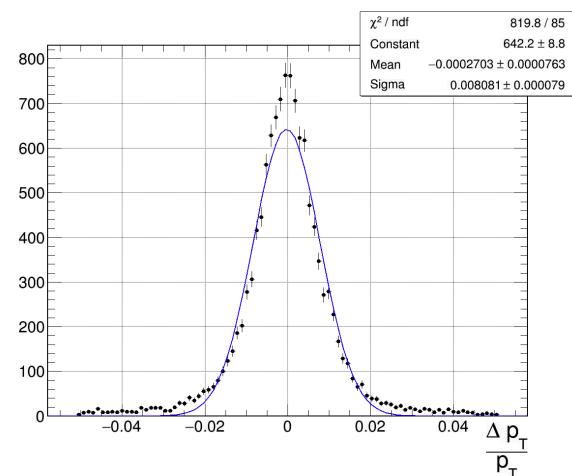
Cylinder Tracker



Cylinder Tracker with ladder INTT material budget



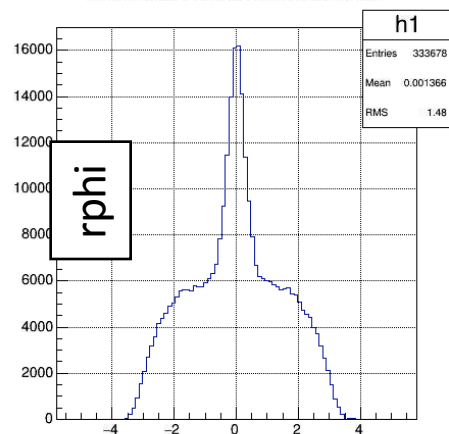
Ladder tracker



Ladder tracker clustering pulls

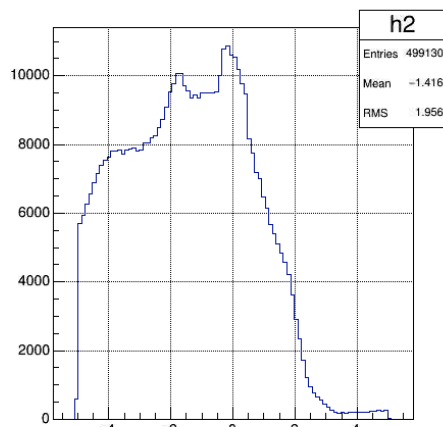
MAPS

dphi/ephi {abs(dphi/ephi)<5.000000&&(gr < 4)}



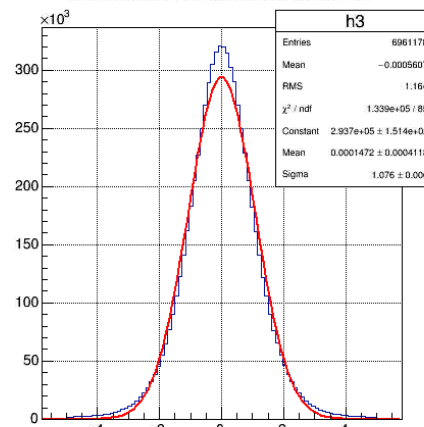
INTT

dphi/ephi {abs(dphi/ephi)<5.000000&&(gr > 4 && gr < 29)}



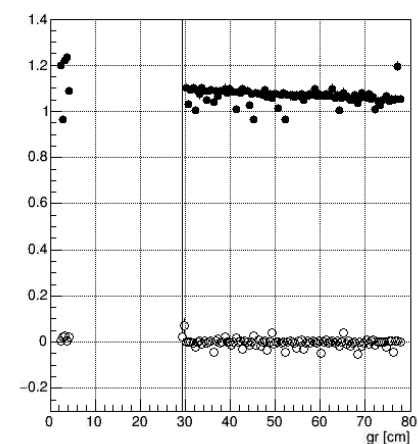
TPC

dphi/ephi {abs(dphi/ephi)<5.000000&&(gr > 29)}

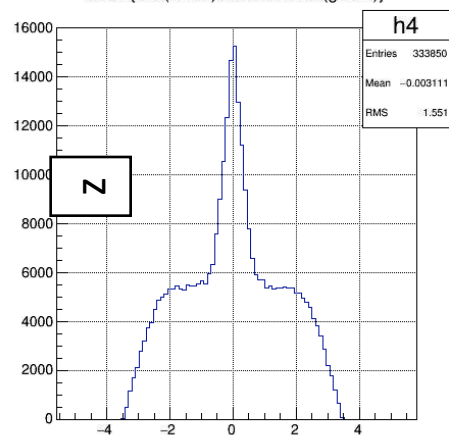


Pull vs. radius

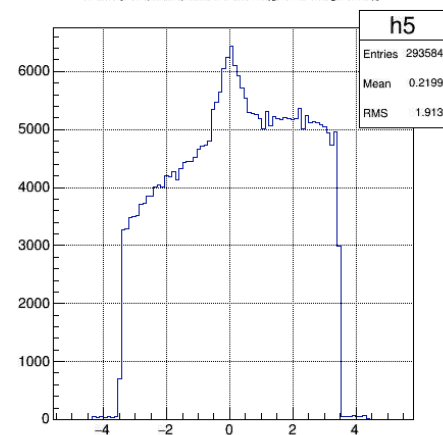
r*phi pull



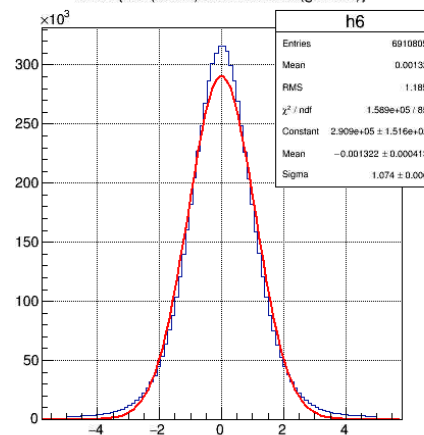
dz/ez {abs(dz/ez)<5.000000&&(gr < 4)}



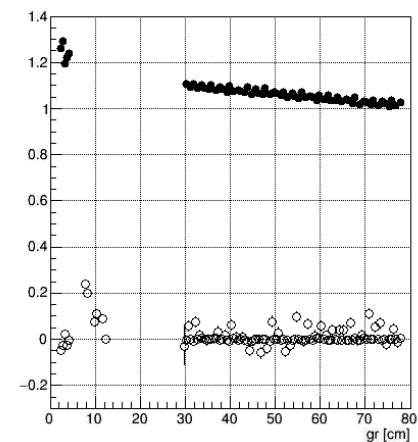
dz/ez {abs(dz/ez)<5.000000&&(gr > 4 && gr < 29)}



dz/ez {abs(dz/ez)<5.000000&&(gr > 29)}

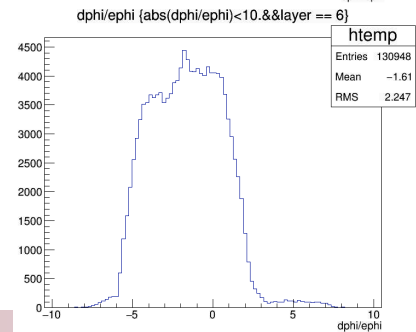
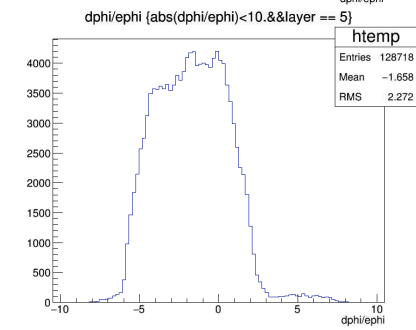
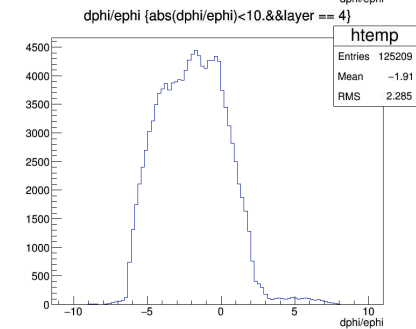
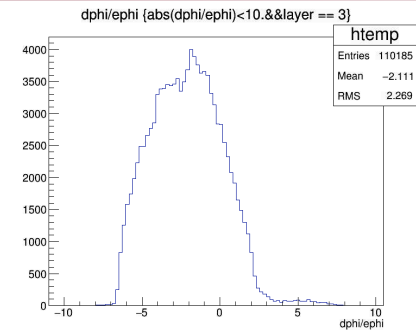
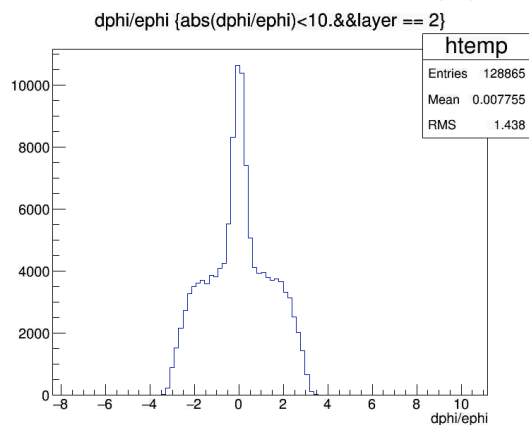
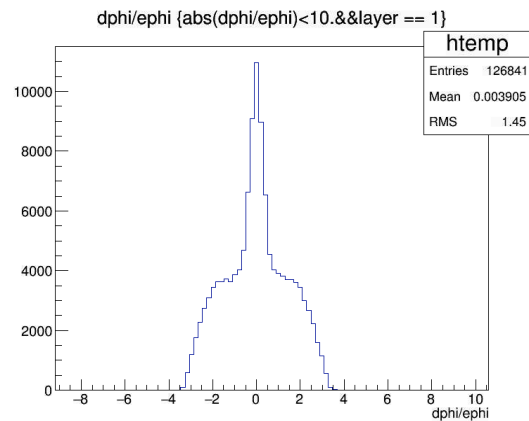
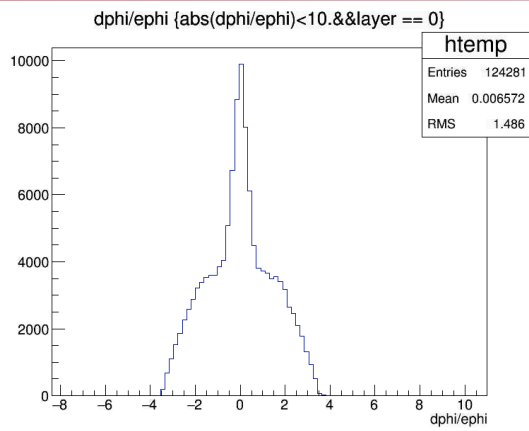


z pull

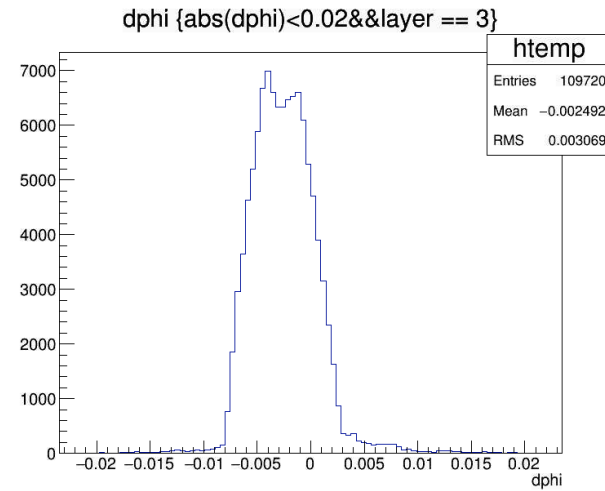
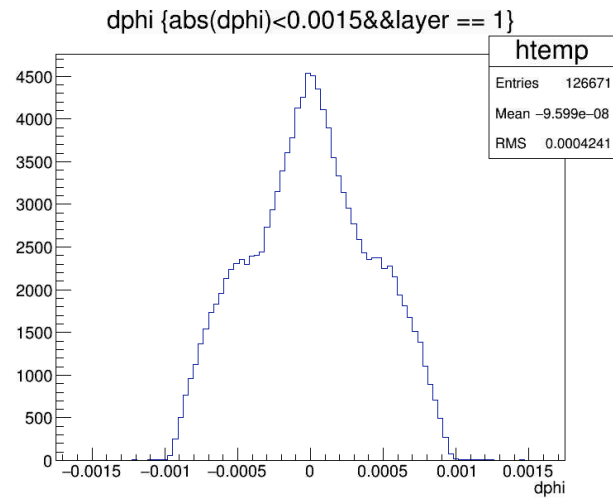
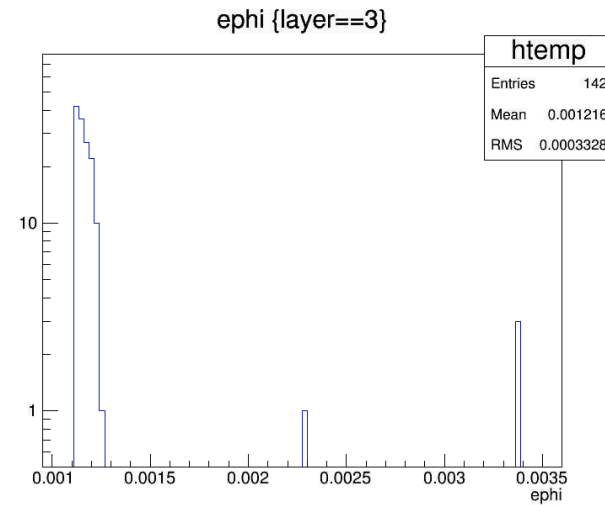
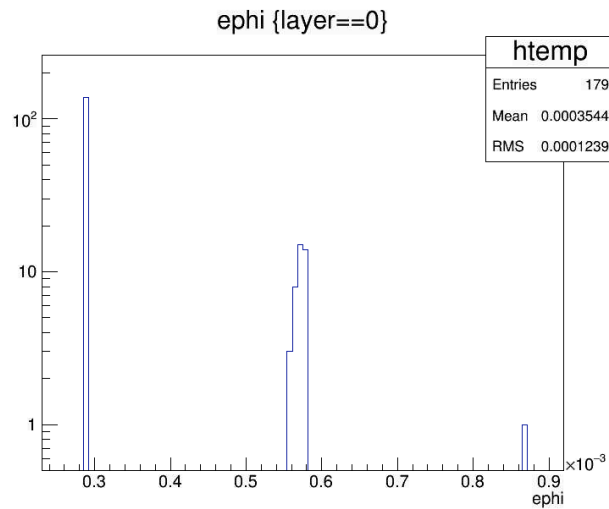


Backups

MAPS and INTT pulls for each layer



rphi cluster uncertainties



Double check the material budget with runtime log file

```
layer 3
PdbParameterMap::print - Hash 0x43d3c6c0febf7acd
double parameters:
length: 100
place_x: 0
place_y: 0
place_z: 0
radius: 6.0121
thickness: 0.025776
tmax: nan
tmin: nan
integer parameters:
absorberactive: 0
absorbertruth: 0
active: 0
blackhole: 0
lengthviarapidity: 1
string parameters:
material: G4_Cu
-----
```

$$0.025776/0.0144 = 1.79$$